THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS

A Task Force Survey Report

for

The State Government Survey Committee

November 1952

State Division
Pennsylvania Economy League
Harrisburg

PENNSYLVANIA ECONOMY LEAGUE, INC.
FOUNDED 1932
STATE DIVISION
611 BLACKSTONE BUILDING • HARRISBURG

November 21, 1952

Mr. Francis J. Chesterman, Chairman
Mr. John N. O'Neil, Executive Director
State Government Survey Committee
P. O. Box 231, State Capitol
Harrisburg, Pennsylvania

Gentlemen:

We submit herewith our report on an administrative study of the Department of Highways. This report is devoted primarily to the departmental administrative and field organization and to its performance of the functions assigned to it by state law.

In the main, we found the Department to be a well administered organization. The principal deficiency seems to be in the recruitment of younger technical engineering personnel. Our recommendations for dealing with this situation and for other organizational improvements and savings in operating costs are set forth in summary form in the forepart of the report.

In the technical and engineering aspects of the survey, we worked with Mr. Sidney R. Collins, Consulting Engineer of Lewisburg, who was retained for this purpose by your committee. The staff work by the League was under the direction of Mr. Richard E. O'Daniel of this Division.

Very truly yours,

Welles A. Gray

Welles A. Gray
Vice President

WAG:abq

THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS

A Task Force Survey Report

for

The State Government Survey Committee

November 1952

State Division
Pennsylvania Economy League
Harrisburg

PRINCIPAL FINDINGS AND RECOMMENDATIONS

1) A Highway Department Advisory Board or Commission should be established to assist the Secretary of Highways in the formulation of general highway programming and policy. It should help create and enforce more constructive personnel policies for engineers.

2) The vacancy in the position of Assistant Chief Engineer should be filled. The position of the Chief Research Engineer should be eliminated. A new office of Chief of Right-of-Way is needed to give closer control of expenditures for property damages. Other shifts are recommended in the responsibility of certain divisions and bureaus.

3) Highway Department field districts should be reorganized primarily on the basis of engineering needs for construction, particularly in urban areas. As a personnel recruitment aid district offices should have a closer tie-in with engineering schools and colleges throughout the state.

4) The Highway Department faces a very serious problem in maintaining its technical engineering force at the proper level. Constructive changes are needed in existing personnel policies including freedom from political pressure, reasonable assurance of continuity of employment and an adequate standard of living.

5) To furnish more opportunities for promotion of younger staff members, it is recommended that the compulsory retirement age for engineering personnel be placed at 65 years unless an employe is specificially retained by authority of the Advisory Board.

6) Insofar as practicable, maintenance equipment of the same make should be placed within counties or at least the same district. Purchase of additional equipment for the spreading of bituminous materials should also save money

for the Department. Since replacement purchases of equipment have not equalled depreciation charges in the last five years, it is clear that in the near future the Department will be faced with exceptionally large expenditures for new machinery, and replacement of equipment should be put on a more regular basis.

7) The Secretary of Highways and the proposed Departmental Advisory Board should subject force-construction projects to a constant and critical review to be certain that such projects are kept to a minimum.

8) Maintenance and construction of roads and streets by the Highway Department meet an acceptably high standard. However, it is believed that there is a tendency to over-design rural roads carrying low volumes of traffic. It also is undesirable to widen a rigid base road with additional flexible base lanes. In mountainous or difficult terrain, it is recommended that the opposing lanes in multiple-lane roads be separated both as to line and grade in order to cut construction costs.

9) More attention needs to be paid to the maintenance and improvement of urban extensions of highways, as recommended in the report of the Highway Planning Commission. The Department Advisory Board can be of help in this respect in its development of highway policies.

10) The practice of employing outside engineering firms to prepare construction plans is a temporary expedient which should be curtailed or dropped when improved policies for recruitment of engineering personnel have made it possible to expand the technical engineering staff.

11) It is recommended that the Department Advisory Board be given, by the Legislature, the task of carrying out the program of road classification along the lines recommended by the Highway Planning Commission.

THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS

This survey covers, in a limited degree, an organization spending over $150,000,000 per year. Its scope is to present an over-all picture of the Department, its organization and activities, with recommendations for improvement.

The Department of Highways has two primary missions to perform: first, to maintain all the roads and streets comprising the 41,000 mile State Highway System, and second, the modernization of the system by new construction and reconstruction. The organization and ability of the department to carry out this work will be discussed in this report.

GENERAL ADMINISTRATION

In general the Department of Highways appears to be well administered and run in an economical and consistent manner. Chart I which shows the relationship between total administrative expenditures and total gross expenditures illustrates this point. With the exception of the war years when construction was practically at a standstill, the two curves follow the same trend, indicating a fairly constant relationship between total expenditures and administrative outgo.

The administrative branch of the Department appears to be well staffed with little or no excess personnel and is generally well set up for the operations which it has to perform. It is felt, however, that there are deficiencies with respect to the technical engineering personnel which should be remedied as discussed elsewhere in this report. It is believed that the principal savings to be affected are to be found in certain phases of construction and maintenance operations. These also are discussed in detail in subsequent sections.

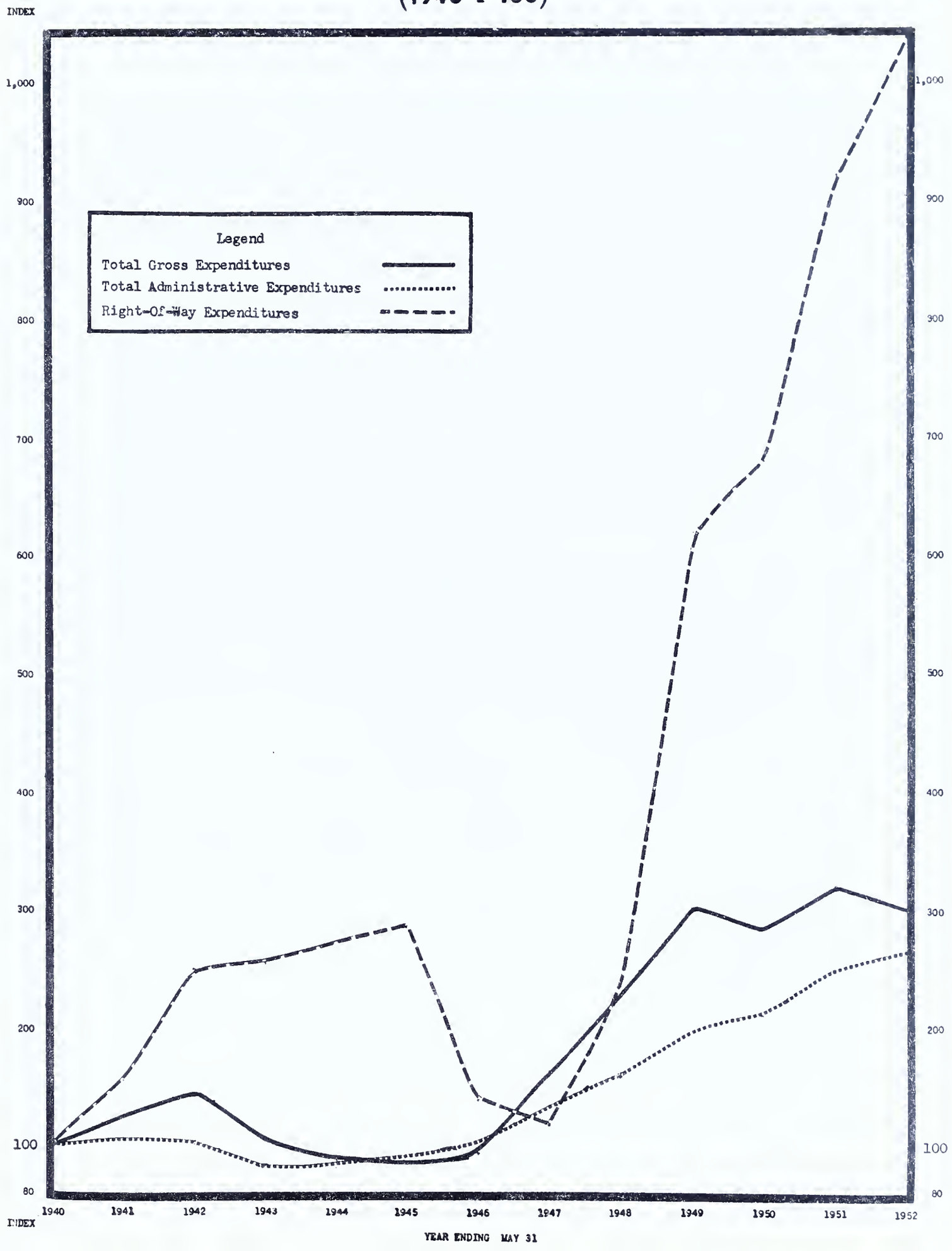
The principal vacancy in the top executive branch is the position of Assistant Chief Engineer and it is recommended that a qualified man be secured for this position.

Chart 1

INDICES OF HIGHWAY EXPENDITURES

1940 TO 1952

(1940 = 100)



DEPARTMENT ADVISORY BOARD

It is believed that a Department Advisory Board or Commission should be established to assist the Secretary of Highways in the formulation of general highway programing and policy and the establishment and enforcement of personnel policies. This board should bear much the same relationship to the department and its operations that the State Board of Assistance bears to the Department of Public Assistance. In pertinent later sections the work of such a board with regard to personnel administration and highway construction and maintenance operations is discussed.

It is proposed that such a board be composed of five members serving overlapping terms of ten years each, with one appointment expiring every two years. In this way continuity of policy and program would be provided for and there would be assurance that no one Governor upon a change of administration could completely recast the board so as to force radical revision in personnel administration or highway policies.

Board members would serve on a part-time basis, perhaps one day a month. Such a board could be of real assistance to the Secretary of Highways in dealing with problems that now consume a disproportionate share of his time.

ADMINISTRATIVE ORGANIZATION

Two condensed organization charts showing functional relationships of the various administrative units are here included to show the changes which it is believed are desirable in the upper organization of the Department of Highways (Charts II and III). The principal proposed change would be the elimination of the Chief Research Engineer, a position which is a misnomer in that little, if any, original research is actually conducted by the Department of Highways.

Chart II

ORGANIZATION CHART
PENNSYLVANIA DEPARTMENT OF HIGHWAYS
(Functional Relationship)

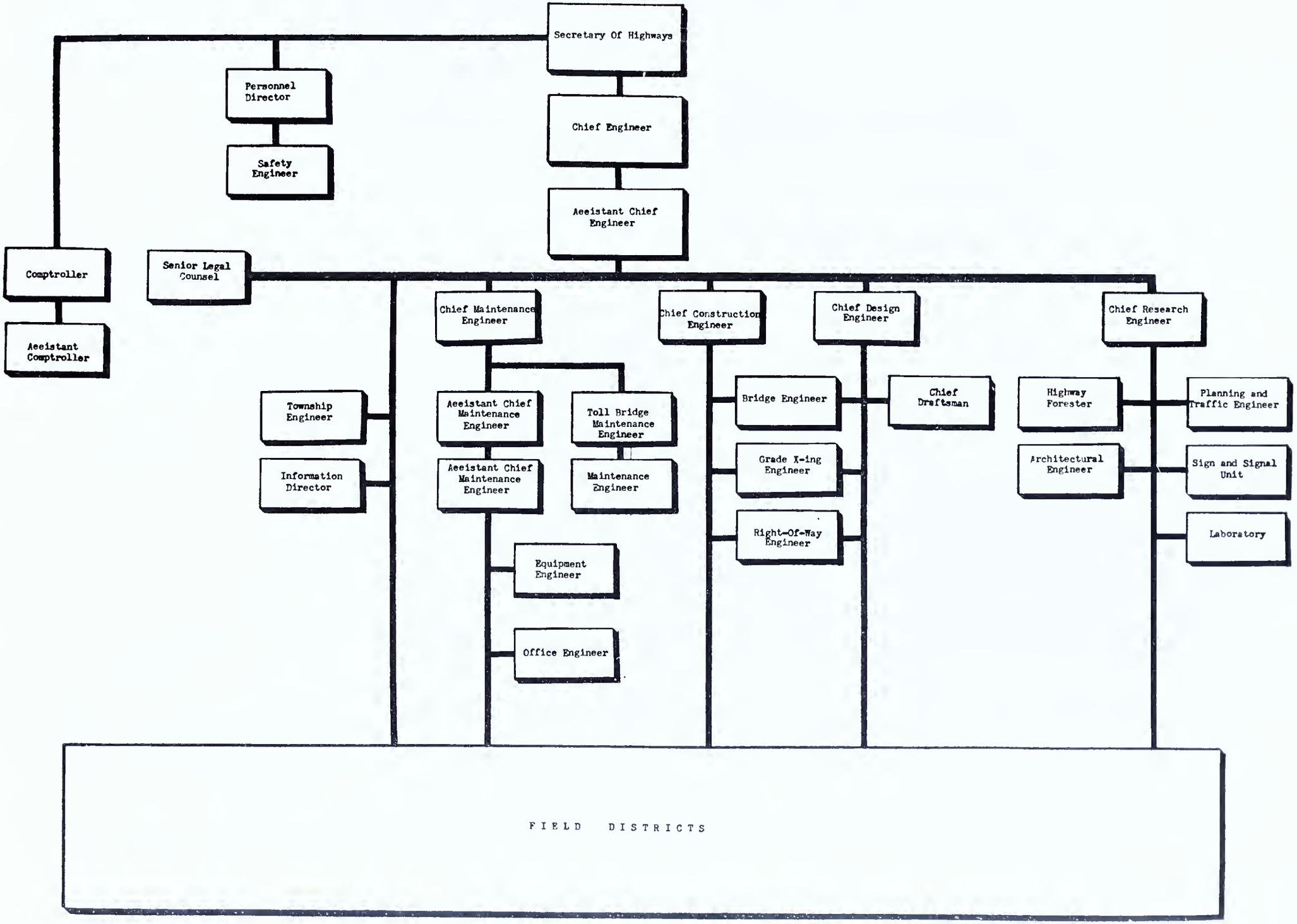
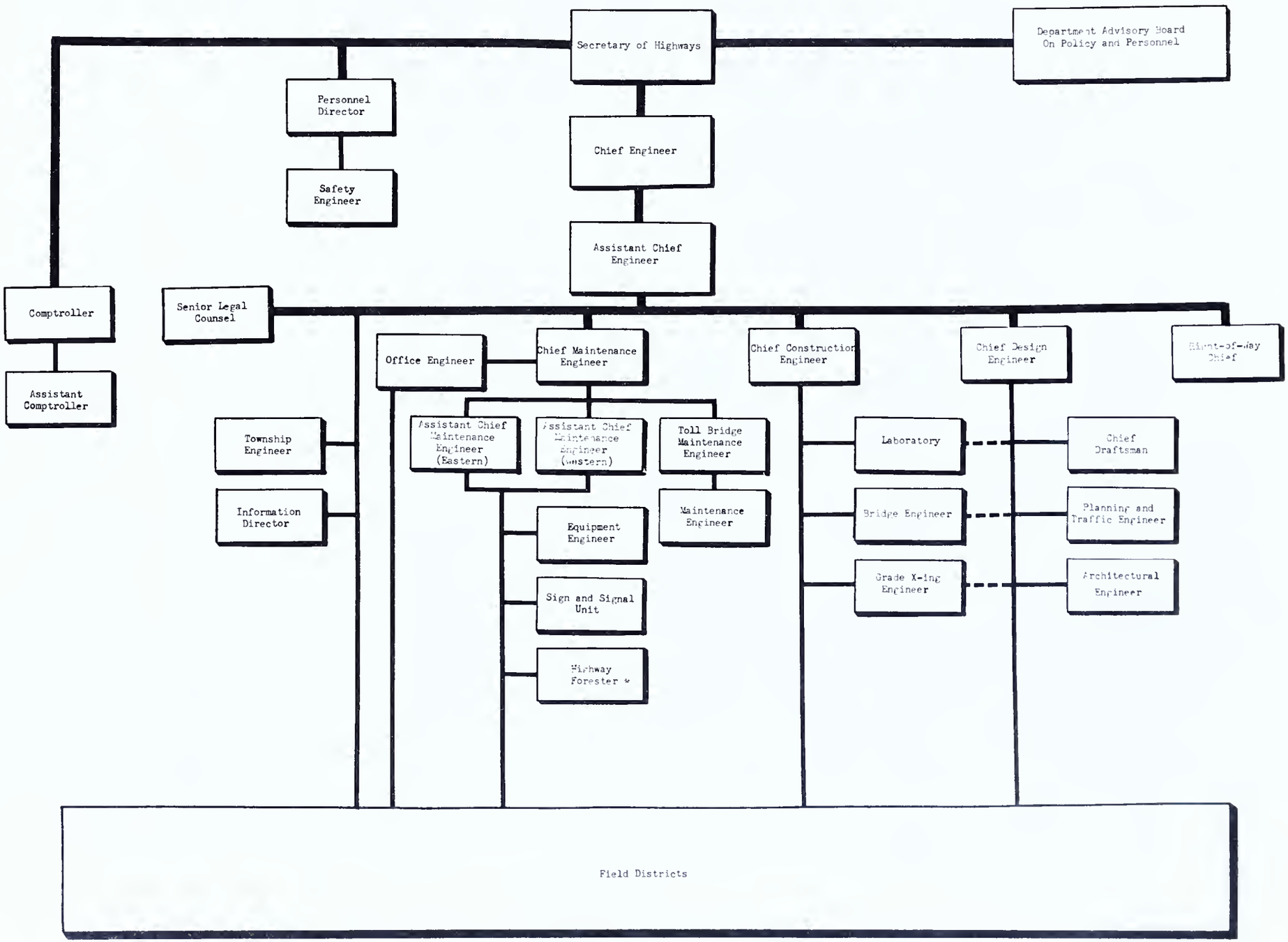


CHART III

PROPOSED ORGANIZATION CHART

PENNSLVANIA DEPARTMENT OF HIGHWAYS

(Functional Relationship)



*Another Report to the Committee proposes transfer of this office to the Department of Forests and Waters.

As presently set up, the Highway Forester, the Architectural Engineer, the Planning and Traffic Engineer, the Signs and Signal Unit and the Materials Testing Laboratory all report to the Chief Research Engineer. In the proposed organization, the Forester and the Signs and Signal Unit would report to the Chief Maintenance Engineer. The Laboratory would be under the control of the Chief Construction Engineer and the Chief Design Engineer would be responsible for the Planning and Traffic Unit and the Architectural Unit.

In addition to the Chief Maintenance Engineer, the Chief Construction Engineer, and the Chief Design Engineer, it is believed that a Chief of Right-of-Way is now needed in view of the enormous rise in right-of-way expenditures in the past few years. This increase is shown graphically in Chart I which compares total gross expenditures of the Department, total administrative expenditures and total expenditures for the acquisition of right-of-way including property damages.

Field Offices

Two outline maps of the state (Charts IV and V) show the present field reorganization of the Department and a recommended redistribution of the field offices, primarily on the basis of engineering needs for construction, particularly in urban areas.

The grouping of the counties of McKean, Potter, Tioga and Bradford to form a new district is suggested primarily to relieve adjacent districts of territories not easily accessible and to provide for more concentrated engineering attention.

Consideration also should be given to the breaking up of District 6, namely the Philadelphia District. The district comprises the counties of Bucks, Montgomery, Chester, Delaware and the City of Philadelphia, a

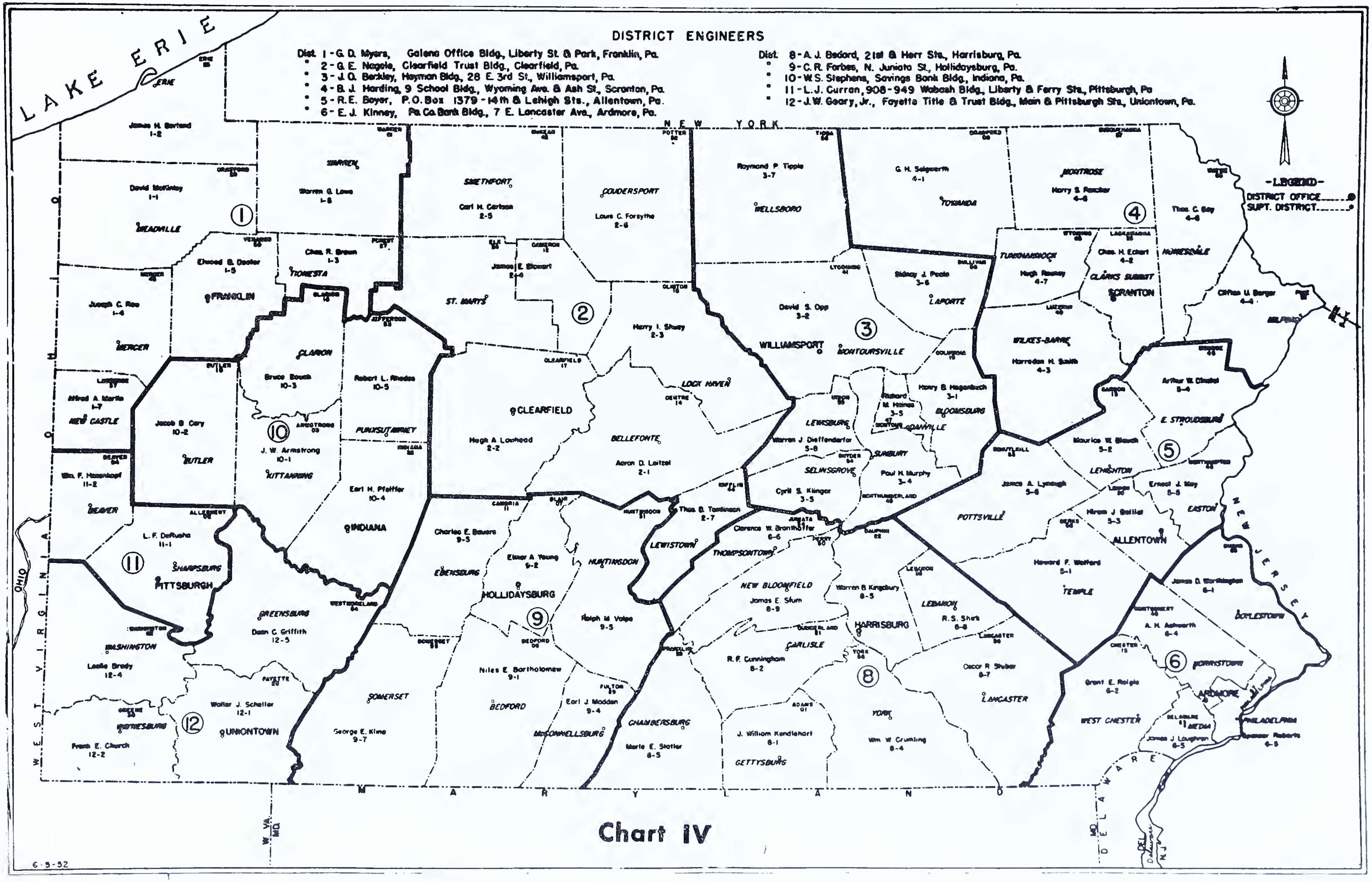
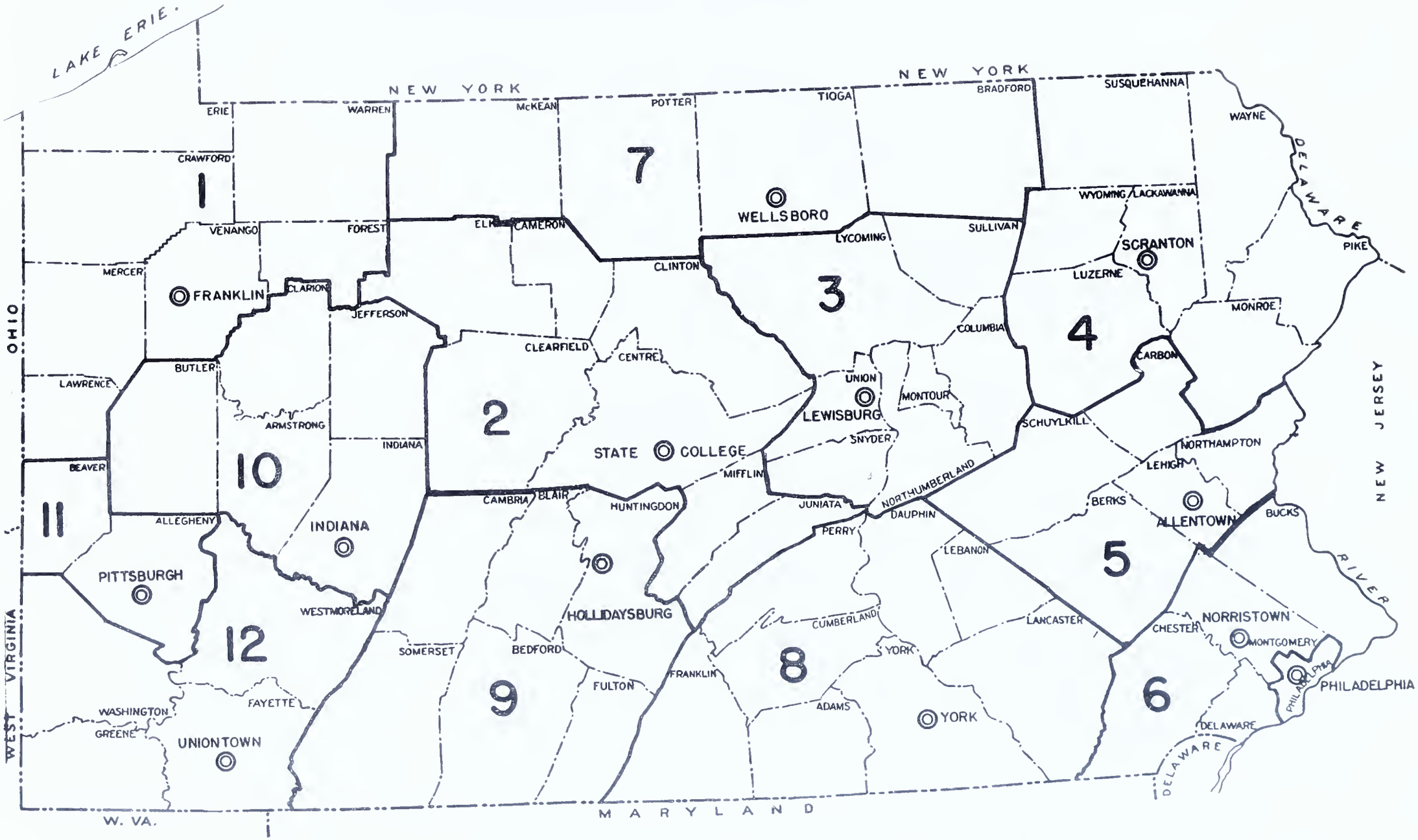

DISTRICT ENGINEERS
Dist. 1 - G. D. Myers, Galena Office Bldg., Liberty St. & Park, Franklin, Pa.
" 2 - G. E. Neagle, Clearfield Trust Bldg., Clearfield, Pa.
" 3 - J. O. Berkley, Hayman Bldg., 28 E. 3rd St., Williamsport, Pa.
" 4 - B. J. Harding, 9 School Bldg., Wyoming Ave. & Ash St., Scranton, Pa.
" 5 - R. E. Boyer, P.O. Box 1379 - 14th & Lehigh Sts., Allentown, Pa.
" 6 - E. J. Kinney, Pa. Co. Bank Bldg., 7 E. Lancaster Ave., Ardmore, Pa.
Dist. 8 - A. J. Bedord, 21st & Herr Sts., Harrisburg, Pa.
" 9 - C. R. Forbes, N. Juniata St., Hollidaysburg, Pa.
" 10 - W. S. Stephens, Savings Bank Bldg., Indiana, Pa.
" 11 - L. J. Curran, 908-949 Wabash Bldg., Liberty & Ferry Sts., Pittsburgh, Pa.
" 12 - J. W. Geary, Jr., Fayette Title & Trust Bldg., Main & Pittsburgh Sts., Uniontown, Pa.
- LEGEND -
DISTRICT OFFICE
SUPT. DISTRICT
LAKE ERIE
NEW YORK
NEW JERSEY
OHIO
WEST VIRGINIA
MARYLAND
DELAWARE
FRANKLIN
CLEARFIELD
WILLIAMSPORT
SCRANTON
ALLENTOWN
ARDMORE
HARRISBURG
HOLLIDAYSBURG
INDIANA
PITTSBURGH
UNIONTOWN
6-5-52

Chart IV



PROPOSED REDISTRICTING OF FIELD OFFICES

Chart V

TABLE 1

COMPARISON BY DISTRICT OF MOTOR VEHICLE REGISTRATION

MILEAGE AND HIGHWAY EXPENDITURES

1951

District Number	Vehicle Registration	Percent of State Total	Mileage	Percent of State Total	Construction and Maintenance Expenditure			
					Maintenance* Expenditure	Percent of Total Expenditure	Construction* Expenditure	Percent of Total Expenditure
Total - All Districts	3,237,822	100%	41,065	100%	$31,032	23.2%	$103,087	76.8%
1	229,842	7.1%	4,130	10.1%	$ 3,226	2.4%	$ 9,057	6.7%
2	117,401	3.6	3,309	8.1	2,885	2.1	6,330	4.7
3	138,596	4.3	3,783	9.2	2,507	1.9	6,562	4.9
4	227,581	7.0	4,589	11.2	3,182	2.4	7,497	5.6
5	324,542	10.0	3,469	8.4	2,635	2.0	7,252	5.4
6	831,576	25.7	3,385	8.2	2,530	1.9	11,710	8.7
8	379,632	11.7	5,855	14.3	3,679	2.7	12,506	9.3
9	166,077	5.1	3,758	9.2	2,774	2.1	6,775	5.1
10	128,382	4.0	3,574	8.7	2,747	2.1	6,839	5.1
11	461,982	14.3	1,559	3.8	1,940	1.4	15,795	11.8
12	232,211	7.2	3,650	8.9	2,955	2.2	12,761	9.5

*In thousands

highly developed metropolitan area. It is believed that the City of Philadelphia alone has sufficient highway problems to warrant a separate district office or at most, to include only one or two of the adjacent counties. The adjacent counties of the district are also highly developed. They, too, could well justify the services of a complete district organization in the preparation of plans and the prosecution of contract construction.

The money expended for maintenance and construction by the various districts during the past fiscal year is shown in Table 1. On a state-wide basis, 23.2 percent of this money was spent on maintenance and 76.8 percent on construction. Obviously the construction expenditures are an important factor in setting the size and location of the districts. A further advantage of the proposed re-districting will be, with the exception of Philadelphia, a tendency to equalize the road mileage contained in each of the proposed districts. The relationship between vehicle registration and expenditure is interesting and is included without comment as it represents only one year's operation and may not represent a long-term average.

PERSONNEL

The Department of Highways faces a serious problem in maintaining its technical engineering force at the proper level. Table 2 gives the distribution by age groups of all the engineers in the Department as of August 18, 1952.

TABLE 2

ENGINEERS BY AGE GROUPS

Ages	Number of Engineers	Percent of total	Cumulative Percentages
20-29	4	1.3%	1.5%
30-39	18	5.9	7.4
40-49	81	26.7	34.1
50-59	131	43.2	77.3
60-69	61	20.1	97.4
70-79	8	2.6	100.0
TOTAL	303	100.0[a]	

[a]Total is not exact because of rounding.

This table clearly indicates that the bulk of the engineering talent in the Department is not far from depletion due to retirement or to illnesses and death which accompany advancing years.

The number of engineers under 40 is alarmingly low while the number of those over 40 is entirely too high in proportion to the total force. Looking toward the future it would seem as if in another 10 years the Department would lose well over half its technical personnel with no large group in the younger age brackets to replace those dropping out.

The available evidence strongly indicates that even when the Department is able to hire young graduates from engineering schools, many, if not all, of these men leave the Department within a year or year and one-half after their date of employment. Table 3 gives data showing the relative experience of all engineers resigning from the Department in the fiscal year 1951.

TABLE 3

LENGTH OF EMPLOYMENT OF ENGINEERS RESIGNING FROM DEPARTMENT OF HIGHWAYS DISTRICT OFFICES IN FISCAL YEAR 1950-1951

Length of Employment	Number	Percent of Total	Cumulative Percentages
Under 6 months	54	38.8%	38.8%
6 months to 12 months	41	29.5	68.3
12 months to 18 months	17	12.2	80.5
18 months to 24 months	2	1.4	81.9
More than 24 months	25	18.0	100.0
	139	100.0[a]	

[a]Total is not exact because of rounding.

This table shows that over 80 percent of the engineers resigning stayed with the Department less than 18 months. This would be approximately a normal period in which to gather practical experience and then depart elsewhere.

Not only is the Department unable to hire enough young engineers but there is also some evidence that it is losing men faster than it is able to replace them. A recent survey of engineering graduates hired and those resigning indicate that the Department suffered a net loss. The data are shown in Table 4 below.

TABLE 4

ENGINEERING GRADUATES HIRED BY DISTRICTS OF THE DEPARTMENT OF HIGHWAYS IN FISCAL YEAR 1950-51 AND THE NUMBER RESIGNING FROM THIS GROUP AND FROM THOSE HIRED IN OTHER YEARS.

District	Number Hired 1950-51	1950-51 Hirings Who Resigned	Total Resignations[a]	Net Gain[a]
Franklin	19	14	21	-2
Clearfield	5	1	1[a]	4[a]
Williamsport	3	3	6	-3
Scranton	-	-	3	-3
Allentown	6	3	4	2
Ardmore	28	21	35	-7
Harrisburg	5	1	1[a]	4[a]
Hollidaysburg	7	6	6[a]	1[a]
Indiana	8	5	7	1
Pittsburgh	48	35	49	-1
Uniontown	-	-	6	-6
TOTAL	129	89	139	-10

[a] Does not indicate if any hired in years previous to 1950-51 resigned.

If the net loss shown in the above table continues for any length of time, it is plain that the administrative efficiency of the Department of Highways will begin to decline as older men drop out and no suitable replacements are available.

The conclusions to be drawn therefore from the above tables are full of dangerous implications. Not only is the Department not getting the technical people it needs, but it is not keeping them and in some cases it is losing men of some years' standing. The advancing age of the remaining group engineers clearly shows that within a few years the available pool of technical talent will drop off at a rapid rate. This situation makes it even more imperative to have a younger group of trainees working up through the ranks. Here again the evidence is that this replacement pool is not in existence and the Department is not able to bring one into existence under the prevailing conditions.

There are several reasons why young engineers are not becoming available to the Department. Probably the principal reason is that the Department pay scales are not the equivalent of those available in private industry. Second, under the prevailing personnel system engineers may be required to have the political sponsorship of a county chairman. Third, if there is a change in the political control of the State at any time there is always the danger that engineering talent may be sacrificed in order to satisfy the demands of patronage. To the average young man seeking a career the political uncertainties of a job in the Highway Department make the situation less desirable than that prevailing in many of the larger industrial corporations or private engineering and construction firms. In the case of the more experienced engineering talent in the Department it is probable that most of these men have kept their jobs because of their investment in the retirement program and that many of them could have left for better positions if they had been willing to give up their stake in this program.

In fairness to the Department of Highways it should be stated that its standards for recruitment of engineering personnel are flexible. An engineer with the Department need not have a college degree. It is perfectly possible for a high school graduate, by following out a rounded experience program in the district highway organization, to achieve eventually a standing equivalent to that of a college trained engineer. There are many such men in the Highway Department today and, with the exception of bridge designers, there appears to be no reason why high school men could not move up through the ranks if they so desired. However, the lack of engineering talent in the younger age groups indicates that available high school graduates either do not have the ambition or the talent to make such a move. Therefore, it would seem evident that even with a program of training of high school individuals it would still be important to attract and retain college personnel.

The seriousness of the personnel problem in the Highway Department demands constructive action. It is recommended that the following conditions be established to secure and maintain a first class engineering organization:

Freedom from political pressure

Reasonable assurance of continuity of employment in one district with the consequent possibility of home ownership

An equitable pay scale with reasonable chance for advancement

Adequate standard of living

Old age security, which can be provided by the State Retirement Act if it is modified to take care of unexpected demise of an employe and allow full payment of benefits to his widow or heirs

The Department Advisory Board proposed above should develop general personnel policies which would foster the foregoing objectives. This new personnel policy would involve from about 300 to a maximum of possibly 500 men employed by the Department of Highways. All others not classified as engineering personnel should receive the same treatment as is accorded all other employes of the state.

It is suggested that personnel policies provide that in the recruitment of technical people within the Department a high school graduate or a young graduate engineer would be equally acceptable upon approval of this board but only on a tentative or probationary status. If, after a specified period of time, perhaps not to exceed two years, the new employe was found to be suitable for highway work, he would be put on a permanent status.

Within a reasonable time after his being given a permanent status he would be required to pass successfully the preliminary examinations of the State Registration Board for Engineers. After he had served the required time, he would be required to take his final examination for the acquisition of a license from the State Registration Board of Engineers. Failure to pass

either the preliminary or the final examination would result in remaining within grade in the employment of the Department until able to pass these examinations and obtain a license.

After having successfully passed and obtained licenses, engineers would be eligible for promotion as occasions arose and would be protected from removal as long as the duties of their office are performed efficiently. In case of dismissal any engineering employe would have the right of appeal to the advisory board which would review his case and act upon it on its merits. Thus the policies of the advisory board should be directed at assuring the Department of Highways means of recruiting young engineers, offering them assurance of continuity of employment and removing them from political influence. This method of operation would have the further advantage of encouraging promotion on merit as displayed by the individual and recognized by his superiors.

It is further recommended that the compulsory retirement age for technical employes be placed at 65 years unless specifically retained by authority of the Advisory Board. This is a necessary regulation to encourage young engineers with prospects of advancement and to insure the training of reliable successors to top executives.

Another aid to recruitment of junior engineering personnel would be a closer tie-in between the department's district offices and engineering schools and colleges in various parts of the state. A closer cooperative relationship should encourage more engineering graduates to seek jobs with the department. To provide more facilities for such coordination it is suggested in the plan of district reorganization referred to in Chart III that district engineering offices be put in State College and Lewisburg.

MAINTENANCE

An analysis of maintenance expenditures for the years 1939-40 as compared to the years 1951-52 on a cost per mile basis of the various classes of work ordinarily considered maintenance is shown in Table 5. The increase in total costs between the pre-war year of 1939-40 and the most recent fiscal year was just over 100 percent. Chart VI gives indices of certain highway costs indicating the hourly wage rate paid to maintenance employes, the maintenance cost per year per mile, and the Engineering News Record construction cost index for each year from 1940 to 1952. The first two of these lines offer a significant comparison. Since the maintenance cost per mile does not rise as rapidly as hourly wage rates this is an indication of economical and efficient operation of the maintenance forces.

Table 6 shows the number of men employed by the maintenance department for January, May, August and November of each year from 1930 to 1949. Chart VII shows graphically by months the number of employees engaged in maintenance and force construction 1935-1952. These data indicate that in the past few years the Department labor forces have been stabilized and are practically constant for all four seasons of the year.

In general, the maintenance operations as conducted by the Department of Highways are considered to be satisfactory. While it is true that many people complain of snow removal, it is a fact that the snow must fall on the road to a sufficient depth that can be plowed before the plows are effective. Moreover, it takes a certain amount of time for the equipment to travel over the roads. This operation cannot be done simultaneously throughout a sizeable area and there have to be certain priorities. Residents of other states in the snow belt commend Pennsylvania's snow removal program and the prompt placement of abrasives on icy pavements.

TABLE 5

CONDENSED TABULATION OF OPERATING COST OF

GENERAL MAINTENANCE

Class of Work	1939 - 40 Cost Per Mile	1951 - 52 Cost Per Mile	Percent Increase or Decrease
Grand Total	$217.02	$434.42	100.2
Mowing	$ 20.70	$ 39.34	90.0
Berms and Gutters	58.80	101.03	71.8
Removing Slides	7.13	6.41	-10.1
Maintaining Views, Trees, Shrubs, etc.	1.72	3.80	120.9
Total Berms, Ditches - Slopes	$ 88.34	$150.62	70.5
Signs and Traffic Lines	$ 11.16	$ 35.28	216.1
Maintaining Guard Rail	5.39	11.64	116.0
Total Safety and Traffic Service	$ 16.55	$ 46.92	183.5
Base and Surface Maintenance	$ 97.60	$213.33	118.6
Bridges and Indeterminate	7.89	14.92	89.1
Total Miscellaneous - All Classes	$ 6.64	$ 8.62	29.8

Chart VI

INDICES OF HIGHWAY COSTS

1940 TO 1952

(1940 = 100)

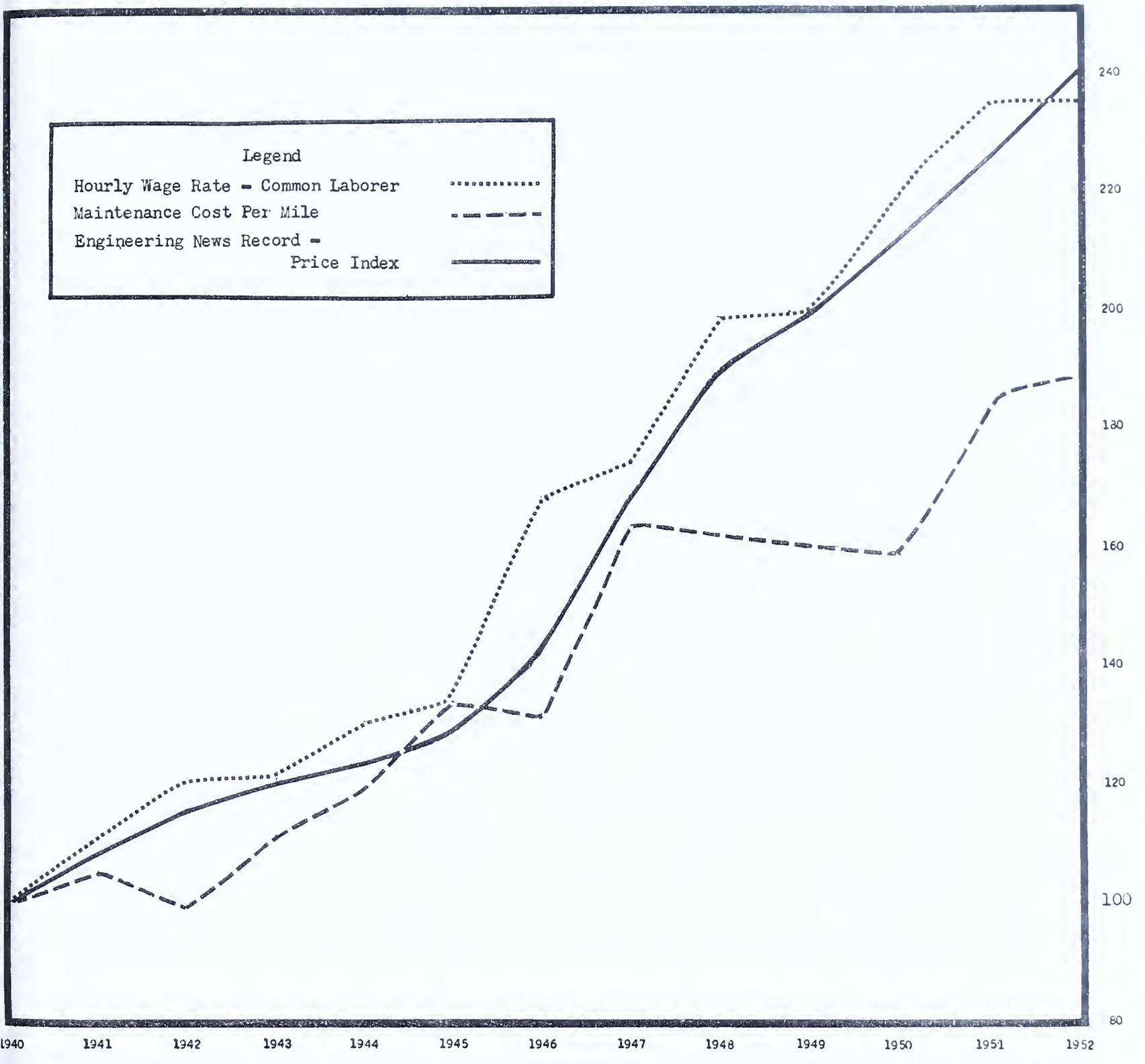


TABLE 6

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HIGHWAYS

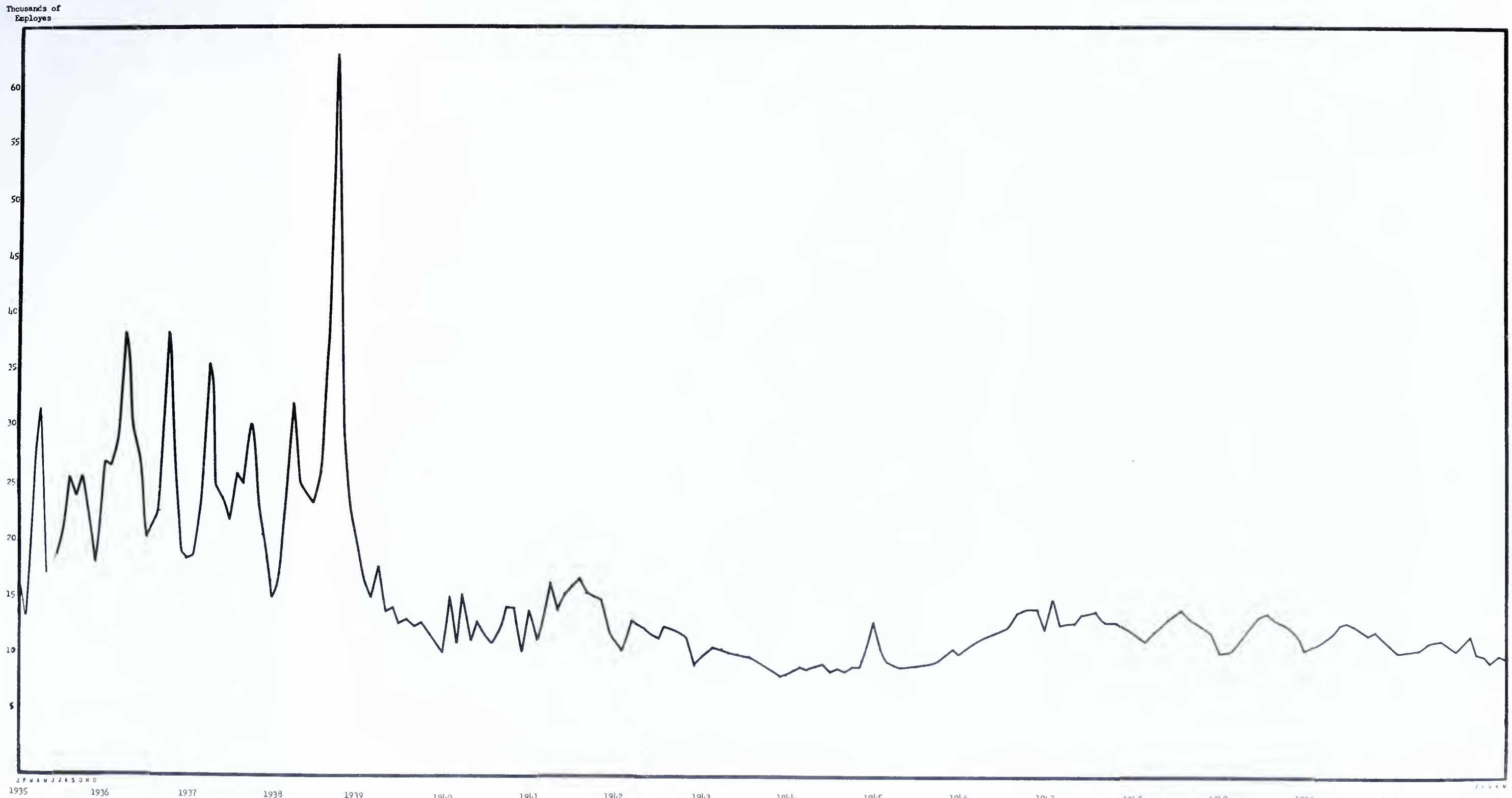
NUMBER OF MEN IN MAINTENANCE FORCES

Year	Employed as of the End of January	Employed as of the End of May	Employed as of the End of August	Employed as of the End of November
1935	16,633	17,350	26,529	22,588
1936	27,243	30,076	22,069	28,580
1937	18,684	26,265	26,269	23,160
1938	15,285	25,480	26,888	29,657
1939	20,056	14,144	14,754	12,425
1940	11,095	11,862	11,340	14,719
1941	13,881	14,256	16,796	15,029
1942	11,416	12,900	12,937	12,172
1943	10,427	10,412	10,232	9,276
1944	8,756	9,336	9,191	9,448
1945	13,264	9,336	9,741	10,552
1946	10,626	11,978	12,767	14,286
1947	12,623	13,210	14,176	13,596
1948	12,566	12,853	14,088	12,780
1949	10,591	12,467	13,894	12,823
1950	10,729	12,343	13,057	12,480
1951	11,319	10,882	11,737	11,268

CHART VII

MEN EMPLOYED IN MAINTENANCE AND DEPARTMENT FORCE CONSTRUCTION

1935 - 1952
(By Months)



Field Inspection

In the time available for this survey it was not possible to make an extensive field check. A carefully selected sample of about 800 miles of road was traveled. This included all classes and types of road - rural and urban, heavy traffic and light traffic, trunk lines, intercommunity roads and local roads, and all types of pavement.

It was found that for the most part these roads were well maintained. In no instances were large groups of men found working along the highways, which would indicate that the maintenance employees are well distributed throughout the district. There was no evidence of men doing useless work. Each operation observed appeared to be a task necessary to the maintenance of the road and its safety.

Equipment

Maintenance equipment is now distributed among counties and districts without regard to make. It is recommended that as far as practicable the same makes of equipment be placed within counties or at least within districts. For example, make Dauphin County a Ford county and use Ford trucks within the county to the exclusion of all other trucks and in a like manner make Cumberland County a GMC county and in that county use all of that make of equipment, and so on. This is suggested because it will make the mechanics more familiar with certain types of equipment and will permit the stocking of fewer parts for servicing it.

In general, the Highway Department special purpose equipment is used over a long period of time until it is worn out. It is then sold for junk.

In some instances, this is a questionable practice, particularly in the case of snow removal trucks, when repeated breakdowns will stop the flow of traffic.

Rentals charged and depreciation allowed on most of the equipment appear to be fair and reasonable considering the limited use to which some of it is put. However, it is believed that serious consideration should be given to the revision of depreciation schedules of specialized equipment, such as 4-wheel drive trucks purchased and used primarily for snow removal. Such schedules should be extended over a longer period of time and brought closer to the actual useful life as indicated by past experience of the Department. In instances of this kind, it does not appear either necessary or practical to attempt to follow too closely existing commercial practice.

The following tabulation indicates the current inventory value of equipment. Checking these figures against the depreciation schedules indicates that equipment is being kept in use about twice as long as the schedules call for:

SUMMARY - NUMBERED ROAD EQUIPMENT

MAY 15, 1952

Equipment	Number of Pieces	Original Cost	Inventory Value	Percent of Original Value
Rental-Autos and Trucks	2,354	$9,608,935.03	$1,548,079.76	20.0
Rental - Other	6,061	8,562,148.89	2,448,679.08	28.6
Non-Rental	2,797	614,609.37	143,977.28	23.4
Total	11,212	$16,785,693.29	$4,140,736.12	24.7

A review of the records also shows that since 1946 replacement purchases of equipment have not equalled depreciation charges.

All this clearly indicates that the Highway Department in the near future will be faced with the exceptionally large expenditures for equipment, particularly in view of the greatly increased costs of replacements. More emphasis should be given to replacement of equipment on a regular basis.

Bituminous Surface Maintenance

The Department, in 1952, has contracted with outside firms for the unloading, hauling and distribution of 20,107,000 gallons of bituminous materials

at a cost of $428,531, or at the rate of $4.28 a ton. It is believed that the Department could effect an annual saving of about $250,000 if this equipment was owned and operated by the Department. The savings would occur as follows:

Unloading, Hauling and Distribution	$60,000
Increased Efficiency of Overall Operations	190,000
Total	$250,000

A further saving would result from better coordination of this work with the Department's regular maintenance activities.

It is recommended that this be given a fair trial in one district using the following equipment:

Two heaters @ $9,000	18,000
Two 5,000 gallon tank trailers @ $9,000	18,000
Two 1,000 gallon distributors mounted on Department trucks @ $3,500	7,000
Total	$43,000

The above figure represents the purchase price of equipment the Department would be required to buy for one district to inaugurate this program. Eight such units would probably be sufficient for the entire state.

Highway Department Force Construction

The normal maintenance operations of the counties in Pennsylvania are as follows:

From November 1 to March 31 the safe movement of traffic is of primary importance. This involves the erection of snow fences, stocking of cinders and placement on slippery roads, and the removal of snow as it occurs. During this period sufficient men must be available to man the equipment given to each superintendent and also to give each highway caretaker sufficient help. This is the key to the number of men employed by the Department, for if a district is short-handed at this time, traffic must suffer either through the closing of roads or by driving under extremely hazardous conditions. In any event, it

results in a net decrease of highway user-tax revenue to the Department if this service is not maintained constantly and efficienty through the winter months.

At the end of the snow season, snow fences must be removed from private property. Immediately following the season of snow removal, the maintenance organization is also faced with the task of restoring winter damage to pavements, shoulders, structures and, in fact, to all highway appurtenances. The speedy completion of this work is of great importance so that inconvenience to traffic may be avoided at all times. The volume of this work depends largely upon the character of winter damage. Consequently, the time required to restore these surfaces and other appurtenances is always uncertain, and depends upon winter weather conditions. A period of drying out of sub-grades, surfaces, shoulders, etc., is required before the work can be completed. This work program occupies the forces until the latter part of May, frequently even into June in the northern-tier counties.

During June, July and August, maintenance forces are engaged in re-surfacing bituminous pavements, mowing, painting of signs, and other operations needed to keep the highways in the best possible condition.

During September and October there normally is a lull at which time it is extremely difficult to keep the maintenance forces occupied without undertaking some other form of work. To have this work useful, it is necessary that minor construction projects be undertaken. By minor construction projects is meant projects requiring only the equipment available to the Department from its own equipment pool. Jobs which can thus be undertaken efficiently are the widening of the narrow pavement with stone base and bituminous surface; also the construction of short sections of rural roads where the grading is of a very light nature which does not require heavy equipment for its prosecution. These projects should be short and should be timed so that they can be done during this slack period. They should also be of such a nature that it is not necessary

to hire additional help for their completion.

Under these conditions, it is believed that minor construction projects, such as are outlined above, are of considerable value to the Department of Highways and it is not felt that they interfere in any serious way with the operations of the contractors throughout the state. Ordinarily, this work would be of such a nature that very few contractors would be interested in bidding on such small jobs.

The degree to which the Highway Department engages in construction work has always been a subject of controversy. Where projects have been undertaken by force account which could be better handled by private firms, this has been due in part to a lack of engineering talent to prepare plans and specifications, a problem which is discussed elsewhere in this report.

The stability of the maintenance force which was previously illustrated in Chart VII, is, however, an indication that departmental construction is largely a fill-in job, which it is intended to be. For, if the Highway Department was unnecessarily expanding construction work, the number of hourly wage workers would be bound to show a pronounced seasonal peak during the summer months. Furthermore, there appears to be little reason to believe that the total force is too big for the maximum maintenance load.

To provide constructive work for the maintenance forces during the slack period recurring late each summer it is recommended that construction projects as outlined previously be provided. These projects should be small, distributed uniformly over the state, and should be limited in gross expenditure to from one-half to three-quarters of the hourly payroll for a two-month period plus an equal amount for materials or equipment. At present pay scales this limit would approach $10,000,000 annually.

This work should always be subject to a constant and critical review both as to its appropriateness and as to the nature of the various projects

themselves. This task of checking should be assigned to the Department Advisory Board proposed earlier in this report. The Board and the Secretary of Highways should from time to time assure themselves that the Department has actually been following as closely as possible its announced policy of keeping this work at a minimum.

CONSTRUCTION

Design

In general, construction of new roads and streets as carried out by the Pennsylvania Department of Highways meets an acceptably high standard. It is believed, however, that there is a tendency toward over-design for rural roads carrying low volumes of traffic, particularly roads classed as Inter-community Roads and Community Service Roads in the report of the Highway Planning Commission. Insistence on perfect alignment and grades on these low traffic roads frequently results in exhorbitant property damage and consequent right-of-way settlement.

It is also believed that the practice of widening with a flexible base a rigid base or concrete road prior to resurfacing with bituminous concrete is fallacious. It creates in the course of time a traffic or driving hazard and a serious maintenance problem.

It is further believed that superior riding qualities of flexible base pavements will be secured if a temporary surface is placed on the base during original construction and later the permanent bituminous concrete surface is placed after traffic and a year's weathering have stabilized the base.

In 1951 the Legislature amended the legal limitation of 120 feet on right-of-way to permit acquisition of such additional land as may be necessary in the judgment of the Secretary of Highways for medial strips on multiple lane highways. The former limitation of 120 feet of right-of-way worked to the disadvantage of the Department in that it required, in our mountainous

terrain, the paralleling of multiple lanes to a large extent both for alignment and grade. It has been noted in Virginia, in particular, that separation of lanes both in alignment and grade is practiced to a great extent with considerable economy in construction costs and a minimum of interference with traffic. It is recommended that the Department make greater use of this type of design. This would result in a considerable saving in construction costs which would more than offset the additional cost of the wider right-of-way.

Observation of many of the municipal or urban extensions of state highways indicates that for the most part these extensions are deficient in comparison with standards of construction existing in rural areas. There are innumerable instances of a modern, high-type road approaching an urban area and at the municipal boundary, the width, type and condition of the highway change markedly for the worse. It is realized that it is more difficult and requires a great deal more time both in design and in right-of-way negotiation to construct highways within urban areas. Undoubtedly, due to the lack of engineering personnel, this work is too often postponed. The easier rural jobs are carried to completion, allowing the urban extensions to remain as they are with only such maintenance as is needed to keep them in passable shape.

The negotiations prior to construction of a city street, with the municipality and with the utility companies such as water, gas, light, telephone, power and surface transit corporations are often an involved and tedious process. To clear all of these matters with the local governing organizations and various interests may well require a period of some months up to, in some instances, several years. But since a major portion of the tax revenues of the Highway Department are derived from traffic in urban areas, more emphasis should be placed on projects within these areas.

Contract Engineering

Since 1946 the Department has contracted with private engineers for

the surveys and plans of roads at an agreed total price for such engineering service of $7,854,368. For the past fiscal year this work amounts to $2,110,878, which does not include inspection. These expenditures if made for State-employed engineers and designers would provide for about 40 survey-design teams which could reasonably be expected to turn out completed plans for several hundred miles of road each year. On this basis it appears that these expenditures were fair and reasonable.

On the other hand, this program was resorted to as a direct result of the failure of the recruiting program for engineers. Top officials of the Department do not favor this method of construction plan preparation, but until it is possible for the Department to augment its present engineering forces, this method must continue. Otherwise, the Department will be unable to construct new roads and streets to the limits of the funds available.

HIGHWAY PLANNING COMMISSION RECOMMENDATIONS

It is noted that the Department is following to a great extent the recommendations of the Highway Planning Commission.

Many of the proposed highway improvements were located in cities and their adjacent areas. Their construction will materially improve the deficiencies in urban extensions referred to in the preceeding section. The Departmental Advisory Board proposed earlier in this report can be of material help in this respect through its development of recommendations on highway policies and programing.

At the 1951 session of the Legislature the recommendations of the Highway Planning Commission for complete road classification, the ultimate transfer of roads of local interest now on the state system to local governments, and the transfer of locally administered roads of statewide interest to the state highway system were not enacted in the law. It is urged that these recommendations again be brought to the attention of the Legislature.

It is further recommended that the Departmental Advisory Board be given, by the Legislature, the task of carrying out the program of road classification along the lines recommended by the Highway Planning Commission.